CLAIMS

1. An incremental material urging system comprising:

(f) a container structure having a rear end and a forward end,

(g) a material urging structure,

(h) material urging structure activating means wherein said material urging structure is incrementally advanced from a retracted position at said rear end of said container structure, to a fully advanced position at said forward end of said container structure, where said forward end is a discharge end.

2. The material urging system of claim 1 wherein said container structure includes;

(a) a floor sub-structure,

(b) side wall sub-structures,

(c) a roof,

(d) a top opening,

(e) a top opening cover,

(f) a discharge end closure means.

3. The material urging system of Claim 1 or 2 wherein said material urging structure is incrementally retracted by said activating means from said discharge end to said rear end of said container structure.

4. The material urging system of any one of claims 1 to 3 wherein said activating means are disposed along each side wall of said container structure and wherein said activating means operate substantially in unison.

5. The material urging system of any one of claims 2 to 4 wherein said material urging structure is a close sliding fit within said container structure, said material urging structure adapted to slide on the surface of said floor sub-structure.

6. The material urging system of any one of claims 2 to 5 wherein each of said side wall substructures is provided with a slot extending substantially along the length of said wall substructure, said slot providing a separation between an upper and a lower portion of internal wall sheeting.

7. The material urging system of claim 6 wherein said material urging structure is provided on each side of said structure with a projecting lug, each one of said lugs projecting through one of said slots.

8. The material urging system of claim 6 or 7 wherein each of said slots is co-linear with a rail system said rail system adapted to support and guide a reciprocating beam.

9. The material urging system of claim 8 wherein said reciprocating beam is provided with a plurality of thrust assemblies; said thrust assemblies disposed at substantially equal intervals along the length of said beam, between a forward end and a rear end of said beam.

10. The material urging system of claim 9 wherein each of said thrust assemblies includes;

(a) an assembly support,

(b) a double ended pawl,

(c) a pawl pivot shaft,

(d) a pawl actuator means.

11. The material urging system of claim 10 wherein said double ended pawl is rotatable about said pawl pivot shaft by said pawl actuator means from a first forward thrusting position to a second rearward thrusting position.

12. The material urging system of claim 10 or 11 wherein said pawl actuator means is a linear actuator.

13. The material urging system of any one of claims 10 to 12 wherein each of said double ended pawls is rotated by said linear actuator; said actuator pivotally connected at a first end to one end of said double

ended pawls and at a second end to said reciprocating beam.

14. The material urging system of any one of claims 10 to 13 wherein each of said double ended pawls is provided with a pawl control bracket, said bracket supporting a control pivot shaft.

15. The material urging system of claim 14 wherein each said control pivot shaft is pivotally connected to a common control arm, said control arm being pivotally connected at an outer end to a linear actuator and wherein said actuator is pivotally connected to said reciprocating beam.

16. The material urging system of any one of claims 10 to 15 wherein each said double ended pawl is adapted to thrust against the rearward facing side of said projecting lug when said double ended pawl is in said forward thrusting position and to thrust against the forward facing side of said projecting lug when said double ended pawl is in a rearward thrusting position.

17. The material urging system of any one of claims 10 to 16 wherein that portion of a first end of said double ended pawl adapted to thrust against said projecting lug presents a vertical outer surface when set in said forward thrusting position or said rearward thrusting

position; a second end of said double ended pawl then rotated to a position precluding potential contact with said projecting lug.

18. The material urging system of claim 17 wherein each opposite face of each of said first end and said second end of said double ended pawl is a sloping face, each said sloping face intersecting on the bisector of said double ended pawl so as to form a shallow "V" shaped space and where said sloping opposite face of that end set to a thrusting position is adapted to impart a turning moment to said pawls when impacting on said projecting lug while said pawl actuating means is deactivated.

19. The material urging system of claim 18 wherein each said double ended pawl may be rotated when impacted by a said sloping face to a position about said pivot shaft such that said projecting lug is able to pass said thrust assembly.

20. The material urging system of any one of claims 8 to 19 wherein said reciprocating beam is urged into reciprocating motion by an hydraulic ram pivotally connected at a first end of said ram to said reciprocating beam and at a second end of said ram to said container structure.

21. The material urging system of any one of claims 8 to 20 wherein said reciprocating beam is fitted at its forward outer end with an initial retraction thrust block and at its rear outer end with an initial advance thrust block.

22. The material urging system of claim 20 or 21 wherein, when said material urging structure is in a fully retracted first position at said rear end of said container structure and said hydraulic ram is retracted, said projecting lug is located between said initial advance thrust block and the first thrust assembly located nearest said rear end of said reciprocating beam.

23. The material urging system of any one of claims 20 to 22 wherein said reciprocating motion for a first forward movement of said material urging structure comprises the steps of:

(a) extending said hydraulic ram to urge said initial advance thrust block into contact with said projecting lug so as to drive said lug and said material urging structure to a first partial forward incremented position,

(b) retracting said pawl actuator means to rotate said double ended pawl into a forward thrust position,

(c) deactivating said pawl actuator means so as to allow rotation of said double ended pawls when the sloping face of that pawl set to said forward thrust position is contacted by said projecting lug,

(d) retracting said hydraulic ram so as to retract said thrust assembly nearest to rear end of said reciprocating beam past said projecting lug,

(e) retracting said pawl actuator means to reset said double ended pawls of said thrust assembly nearest to rear end of said reciprocating beam to said forward thrust position,

(f) extending said hydraulic ram to drive said thrust assembly nearest to rear end of said reciprocating beam into contact with said projecting lug thereby driving said material urging structure to a completed first forward increment.

24. The material urging system of any one of claims 20 to 23 wherein subsequent forward increments of said material urging structure comprise the steps of:

(b) deactivating said pawl actuator means so as to allow rotation of said double ended pawl when contacted by said projecting lug,

(c) retracting said hydraulic ram so as to retract the next forward thrust assembly past said projecting lug,

(d) retracting said pawl actuator means to reset the next forward thrust assembly to said forward thrust position,

(e) extending said hydraulic ram to drive forward said next forward thrust assembly thereby driving said material urging structure to a next forward incremented position.

25. The material urging system of any one of claims 20 to 24 wherein, when said material urging structure is in a fully advanced position at said forward end of said container structure and said hydraulic ram is extended, said projecting lug is located between said initial retract thrust block and the thrust assembly located nearest said forward end of said reciprocating beam.

26. The material urging system of any one of claims 21 to 25 wherein a sequence for a first rearward movement of said material urging structure comprises the steps of:

(a) retracting said hydraulic ram to urge said initial retract thrust block into contact with said projecting lug thereby driving said lug and said material urging structure to a first partial rearward incremented position,

(b) extending said pawl actuator means to rotate said double ended pawl into a rearward thrust position,

(c) deactivating said pawl actuator means so as to allow rotation of said double ended pawls when the sloping face of that pawl set to said rearward thrust position is contacted by said projecting lug,

(d) extending said hydraulic ram so as to advance said thrust assembly nearest to forward end of said reciprocating beam past said projecting lug,

(e) extending said pawl control actuator to reset said double ended pawls of said thrust assembly nearest to rear end of said

reciprocating beam to said rearward thrust position.

27. The material urging system of any one of claims 21 to 25 wherein subsequent rearward increments of said material urging structure comprise the steps of:

(a) deactivating said pawl actuator means so as to allow rotation of said double ended pawls when contacted by said projecting lug,

(b) extending said hydraulic ram so as to advance the next rearward thrust assembly past said projecting lug,

(c) extending said pawl actuator means to reset the next rearward thrust assembly to said rearward thrust position,

(d) retracting said hydraulic ram to drive rearward said next rearward thrust assembly thereby driving said material urging structure to a next rearward incremented position.

28. The material urging system of any of claims 1 to 27 wherein said urging system is adapted to the compaction of refuse.

29. The material urging system of any one of claims 2 to 28 wherein said roof is provided with an openable

aperture for the introduction of refuse into said container structure.

30. The material urging system of claim 28 or 29 wherein said discharge end closure means is in the form of a discharge gate, said gate adapted to provide a reaction surface for the compaction of said refuse between said discharge gate and said material urging structure.

31. The material urging system of claim 30 wherein said container structure is provided with an intermediate openable gate positioned between said discharge gate and said openable aperture in said roof, said intermediate gate adapted to provide a reaction surface for the compaction of refuse between said intermediate gate and said material urging structure.

32. The material urging system of any one of claims 1 to 31 wherein said container structure is provided with a plurality of articulated compaction devices; said devices supported by hinges along said sides of said container structure; said devices acting through apertures in said sides to intrude into a volume of refuse contained in said container structure.

33. The material urging system of claim 32 wherein said articulated compaction devices are hinged from said

roof of said container structure; said compaction devices acting through apertures in said roof.

34. The material urging system of any one of claims 2 to 33 wherein said container structure is provided with at least one articulated section of said floor substructure; said section adapted to rise vertically within said container structure to provide compaction force on a volume of refuse.

35. The material urging system of any one of claims 2 to 34 wherein said container structure is provided with at least one articulated section of said roof; said section adapted to descend vertically within said container structure to provide compaction force on a volume of refuse.

36. The material urging system of any of claims 1 to 35 wherein said material urging system is adapted to the transfer of a compacted volume of refuse from said container structure into a transport vehicle.

37. The material urging system of any preceding claim wherein said system is adapted to retrofitting of said system to existing refuse transfer stations.

38. The material urging system of any preceding claim wherein said system is adapted to the reduction in volume of any compactable material.

39. The material urging system of any preceding claim wherein said system is adapted to the discharge of material from a transport vehicle, the load container of said vehicle forming a container structure.

40. The material urging system of claim 6 wherein said material urging structure activating means includes a primary mechanical system and a secondary mechanical system.

41. The material urging system of claim 40 wherein said primary mechanical system includes a pair of hydraulic rams; each hydraulic ram of said pair of hydraulic rams affixed to a rearward end of one of said side wall substantially.

42. The material urging system of claim 41 wherein the piston rod of each hydraulic ram of said pair of hydraulic rams is connected to a respective engagement nest beam.

43. The material urging system of claim 42 wherein each said respective engagement nest beam extends substantially the length of said container structure.

44. The material urging system of claims 41 or 42 wherein each said engagement nest beam is adapted to simultaneous guided reciprocal motion by in-stroke and outstroke action of said hydraulic ram.

45. The material urging system of any one of claims 42 to 44 wherein each nest of said engagement nest beam is provided with an elongate slot.

46. The material urging system of claim 45 wherein each said elongate slot lies in a common horizontal plane with said slot extending substantially along the length of said wall substructure.

47. The material urging system of claim 45 or 46 wherein each successive said elongate slot is spaced along each said respective engagement nest beam according to said in-stroke and out-stroke of said hydraulic ram.

48. The material urging system of any one of claims 40 to 47 wherein said secondary mechanical system is at least partially incorporated within said material urging structure.

49. The material urging system of claim 48 wherein said secondary mechanical system comprises a pair of thrust tongue plates adapted to alternate between a first extended state so as to project from respective sides of said material urging structure and a second retracted state.

50. The material urging structure of claim 49 wherein said pair of thrust tongue plates are urged between said

first extended state and said second retracted state by hydraulic means.

51. The material urging system of claim 49 or 50 wherein each one of said pair of thrust tongue plates projects through respective ones of said slots extending substantially along the length of respective said wall substructures when in said first extended state.

52. The material urging system of any one of claims 49 to 51 wherein each one of said pair of thrust tongue plates is adapted to engage with one of said elongate slots when said thrust tongue plates are in said first extended state.

53. The material urging system of any one of claims 49 to 52 wherein each one of said pair of thrust tongue plates is caused to engage with a respective said elongate slot when each said ram of said primary mechanism is in an in-stroked state.

54. The material urging system of any one of claims 49 to 53 wherein each one of said pair of thrust tongue plates is caused to disengage from a respective elongate slot when said thrust tongue plates are retracted into said first state.

55. The material urging system of any one of claims 49 to 54 wherein said material urging structure is

incremented between an initial position and a successive position by stroking of said hydraulic ram while each one of said pair of thrust tongue plates is engaged with said respective elongate slot.

56. The material urging system of any one of claims 41 to 55 wherein said material urging structure is incremented forwardly when said pair of hydraulic rams out-strokes and rearwardly when said pair of hydraulic rams in-strokes.

57. The material urging system of any one of claims 41 to 56 wherein each side wall of said side wall substructures is provided with a plurality of apertures along the length of said container structure; successive ones of said apertures spaced according to said in-strokes and outstrokes of said pair of hydraulic rams.

58. The material urging system of any one of claims 40 to 57 wherein said secondary mechanical system includes a pair of retainer tongue plates adapted to alternate between a first extended state so as to project from respective sides of said material urging structure and a second retracted state.

59. The material urging system of claim 58 wherein said retainer tongue plates project through respective ones

of said plurality of apertures when in said first extended state.

60. The material urging system of claim 58 or 59 wherein said retainer tongue plates are urged between said first extended state and said second retracted state by hydraulic means.

61. An incremental material urging system comprising;

(a) an elongate floor structure,

(b) at least one guide element extending along a portion of said elongate floor structure,

(c) a material urging structure adapted to incremental movement along said at least one guide element, said urging structure provided with a load urging surface normal to said floor structure and transverse to said at least one guide element,

(d) a material urging structure incrementing means.

62. The material urging system of claim 61 wherein said material urging structure includes a substantially vertical surface adapted to act against moveable load objects.

63. The material urging system of claim 61 or 62 wherein said urging structure incrementing means include:

(a) at least one linear actuator,

(b) a guide element clamping mechanism associated with each said at least one linear actuator.

64. The material urging system of claim 63 wherein each said at least one linear actuator is attached at a first end to a rear portion of said urging structure and at a second end to a said guide element clamping mechanism; said at least one linear actuator lying substantially in a vertical plane through a corresponding one of said at least one guide element.

65. The material urging system of claim 63 or 64 wherein said guide element clamping mechanism comprises a clamping caliper provided with gripping pads adapted to apply frictional force to each side of said at least one guide element.

66. The material urging system of any one of claims 63 to 65 wherein said at least one linear actuator is an hydraulic ram.

67. The material urging system of any one of claims 43 to 66 wherein a said guide element clamping mechanism is activated by an hydraulic ram.

68. The material urging system of any one of claims 63 to 47 wherein an increment of said urging structure for

the purpose of advancing said load objects along said floor structure is effected by the steps of:

(a) extension of said at least one linear actuator while said guide element clamping mechanism is activated to grip said at least one guide element,

(b) deactivating said guide element clamping mechanism associated with each said at least one linear actuator,

(c) retracting said at least one linear actuator.

69. The material urging system of any one of claims 63 to 67 wherein an increment of said urging structure for the purpose of retracting said urging structure is effected by the steps of:

(a) retraction of said linear actuator while said guide element clamping mechanism associated with each said at least one linear actuator is activated to grip said guide element,

(b) deactivating said guide element clamping mechanism,

(c) extending said at least one linear actuator.

70. The material urging system of any one of claims 61 to 49 wherein said at least one guide element is a rail.

71. The material urging system of any one of claims 61 to 69 wherein said at least one guide element is a channel let into said elongate floor structure.

72. An incremental material urging system comprising;

(a) an elongate floor structure,

(b) at least one rail element extending along a portion of said elongate floor structure,

(c) a linear actuator linked by linking means to said at least one rail element, the axis of said actuator disposed in parallel alignment to said at least one rail element, said actuator adapted to urge reciprocating movement of said at least one rail element along said elongate floor,

(d) a material urging structure adapted to incremental movement along said at least one rail element, said urging structure provided with a vertical load urging surface normal to said floor structure and transverse to said at least one rail element,

(e) at least one urging structure clamping element, said element adapted to releasably lock said urging structure to said at least one rail element.

73. The material urging system of claim 72 wherein said material urging structure is supported on said at least one rail elements by friction reducing means.

74. The material urging system of claim 72 or 73 wherein said material urging structure is supported by said floor structure by friction reducing means.

75. The material urging system of any one of claims 72 to 74 wherein said floor structure is provided with material urging structure arresting means.

76. The material urging system of claim 75 wherein said arresting means are comprised of a plurality of vertical articulated pins disposed in pairs transverse to said at least one rail element and at intervals along the length of said at least one rail element equivalent to the stroke length of said linear actuator, said pins adapted to move between a first retracted position flush with said floor and a second extended position projecting from said floor.

77. The material urging system of any one of claims 72 to 74 wherein said material urging structure is provided with friction pads, said pads adapted to be driven downwardly relative to said urging structure so as to provide friction sufficient to arrest said structure at an incremented position.

78. An incremental material urging system adapted to the compaction of a volume of compactable material; said system comprising:

(a) a container structure including floor, roof, and side wall structures closed at a first rearward end,

(b) a loading aperture in said roof for introducing said compactable material into said container structure,

(c) an incrementing urging structure adapted to traversing substantially the length of said container structure,

(d) a discharge gate at a second forward end of said container structure for the ejection of said compactable material.

79. The system of claim 78 wherein each of said side wall structures is provided with an elongate slot extending substantially the length of said container structure; said slot communicating with the inside surface of each of said side wall structures.

80. The system of claim 78 or 79 wherein said urging structure is urged into incremental horizontal motion within said container structure by two cooperating mechanical systems.

81. The system of claim 80 wherein a first one of said two interacting mechanical systems is an incremental urging structure engagement mechanism.

82. The system of claim 80 wherein a second one of said two interacting mechanical systems is an urging structure driving mechanism.

83. The system of any one of claims 78 to 82 wherein said incrementing urging structure is comprised of a box-like structure having at least a material urging front compacting face substantially equal in area and dimensions as the internal cross section of said container structure.

84. The system of any one of claims 78 to 83 wherein said urging structure further includes side elements, top and bottom elements adapted to permit sliding movement of said urging structure within said container structure.

85. The system of claim 83 or 84 wherein said urging structure engagement mechanism is disposed within said box-like structure.

86. The system of any one of claims 81 to 85 wherein said engagement mechanism includes a pair of thrust tongue plates each disposed at one of said sides of said urging structure and urged by actuator means so as to

alternate between a first inwardly retracted state and a second outwardly projecting state; the arrangement being such as to cause each said engagement plate to project outwardly through said elongate slot.

87. The system of any one of claims 81 to 86 wherein said engagement mechanism further includes a pair of retainer tongue plates each disposed at one of said sides of said urging structure and urged by actuator means to alternate between a first inwardly retracted state and a second outwardly projecting state; the arrangement being such as to cause each said retainer plate to engage with one of a plurality of retainer slots in said sidewall structures of said container structure.

88. The system of claim 86 or 87 wherein said actuator means are hydraulic rams.

89. The system of claim 82 wherein said urging structure driving mechanism is comprised of two concurrently operating mechanisms disposed along the outside of each of said sidewall structures.

90. The system of claim 89 wherein each of said two mechanisms is comprised of an incrementing hydraulic ram and an elongate member urged into reciprocal horizontal motion by said ram.

91. The system of claim 90 wherein said elongate member is provided with a plurality of equi-spaced engagement nests; each said nest including an elongate slot.

92. The system of claim 91 wherein each said elongate slot of each of said engagement nests is coincident with said elongate slot in said side wall structure.

93. The system of claim 91 or 92 wherein each said elongate slot of said engagement nest is adapted to receive said engagement tongue plate when said tongue plate is in said outwardly projecting state.

94. The system of any one of claims 91 to 93 wherein spacing between said engagement nests is substantially equal to the stroke of said incrementing hydraulic ram.

95. The system of claim 94 wherein spacing between said plurality of retainer slots is equal to said spacing between said engagement nests.

96. A method according to any one of claims 78 to 95 for forward incremental urging of said urging structure along the length of said container structure; said method including the steps of:

(a) in-stroking said hydraulic rams of said driving mechanism,

(b) urging said thrust tongue plates into said second outwardly projecting state so as to engage with one of said plurality of engagement nests,

(c) out-stroking said hydraulic rams so as to urge said elongate member, said plurality of engagement nests and said urging structure one increment towards said forward end of said container structure,

(d) urging said retainer tongue plates into said second outwardly projecting state so as to engage with one of said plurality of said retainer slots,

(e) urging said thrust tongue plates into said first inwardly retracted state,

(f) in-stroking said hydraulic rams,

(g) iterating steps (a) to (f) until said urging structure reaches a maximum forwardly incremented position.

97. A method according to any one of claims 78 to 95 for rearward incremental urging of said urging structure along the length of said container structure; said method including the steps of:

(a) out-stroking said hydraulic rams of said driving mechanism,

(b) urging said thrust tongue plates into said second outwardly projecting state so as to engage with one of said plurality of engagement nests,

(c) in-stroking said hydraulic rams so as to retract said elongate member, said plurality of engagement nests and said urging structure one increment towards said rearward end of said container structure,

(d) out-stroking said hydraulic rams,

(e) iterating steps (a) to (d) until said urging structure reaches a maximum rearwardly incremented position.

98. A method for the compaction and transfer to a refuse transport means of a volume of refuse, said method including the steps of:-

(a) loading a quantity of refuse material through an opening in the roof of a container structure, said container structure provided with an incrementing material urging structure and an openable discharge gate,

(b) closing said opening so as to provide a sealed container envelope for said quantity of refuse,

(c) incrementally advancing said urging structure to a desired degree of compaction of said refuse material,

(d) aligning the loading aperture of a refuse transport means with said discharge gate of said container structure,

(e) opening of said discharge gate and incrementing said material urging structure so as to discharge said refuse material into said refuse transport means.

99. The material urging system of any preceding claim wherein each increment of said material urging structure from said fully retracted position towards said fully advanced position moves material towards said discharge end.

100. The incremental material urging system of any preceding claim wherein each increment of said material urging structure from said fully retracted position towards said fully advanced position moves material towards said discharge end.

101. A method for the removal of material from the container structure of a transport vehicle, said method including the steps of:-

(a) providing said container structure with a material urging structure, said structure provided with a load urging surface having an area equivalent to the internal cross-section of said container structure,

(b) activating said material urging structure with reciprocating mechanisms adapted to increment said urging structure between a first retracted end to a second discharge end.

102. A method for the movement of material along a supporting surface from a first position to a second position, said method including the steps of:-

(a) providing said supporting surface with a material urging structure, said structure provided with a load urging surface normal to said supporting surface,

(b) activating said material urging structure with reciprocating mechanisms adapted to increment said urging structure between said first position and said second position.

103. The material urging system of any one of claims 1 to 39 wherein each increment of said material urging structure from said fully retracted position towards said fully advanced position moves material towards said discharge end.

104. The incremental material urging system of any one of claims 61 to 77 wherein each increment of said material urging structure from said fully retracted position towards said fully advanced position moves material towards said discharge end.

105. The method of any of claims 98 to 100 wherein each increment of said material urging structure from said fully retracted position towards said fully advanced position moves material towards said discharge end.

106. The method of any preceding claim wherein each increment of said material urging structure from said fully retracted position towards said fully advanced position moves material towards said discharge end.

107. A material urging structure adapted to the transfer of material from a first loaded position to second unloaded position by incremental movements induced by reciprocating extensible urging means; where said reciprocating extensible urging means have an operating stroke significantly smaller than the

separation between said first loaded position and said second unloaded position.

108. A system and method for the compaction of loose material as substantially herein described and with reference to the accompanying drawings.

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